WASHINGTON
SCIENCE TRENDS

HIGHLIGHTS

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Research and Development Funds

The United States is spending more than $12 billion during 1959-1960 for research and development programs, according to new estimates from the National Science Foundation. More than half this money comes from the Federal Government.

* Industrial R&D: Stress on technology throughout the American economy during recent years is highlighted by a rise of almost 160 percent in the volume of funds used in the performance of research and development by private industry over the past few years. In 1953-4 the total was estimated at about $3.7 billion. In 1959-60, spending is estimated at $9.4 billion.

  Trends: For industry, development alone accounts for over 70 cents of every R&D dollar. And in 1956-57, the last years for which figures are available, the Federal Government supplied 65 cents out of every dollar spent for industrial R&D.

* College and University R&D: Educational institutions are not keeping pace with industry in R&D spending, although the rise from 1953 has been a respectable 126 percent. In 1953 the figure was $450 million. It is estimated at about $1 billion for the current year. About 27 cents out of every dollar spent by educational institutions for R&D in a typical year came from these institutions themselves.

  Trends: The Federal Government continues to be the dominant source of college and university research funds, according to the 1956-57 figures. But this may be misleading to some extent since it includes large expenditures for contract research centers administered by these institutions for the Federal Government. Washington supplied 63 cents out of every institutional R&D dollar - but 27 cents of this went to the contract centers.

* Federal Research: The Government spent some $970 for R&D in its own laboratories in 1953-54 and is spending about $1.78 billion this year - an 83 percent increase. In the 1956-57 survey year the Government's own scientific installations received about 25 cents of every Federal R&D dollar.

* Other: Non-profit institutions, including foundations, voluntary health agencies, non-profit research institutions and similar organizations increased their R&D spending from $100 to $250 million from 1953 to 1960. These organizations received about 2 cents from every Federal R&D dollar.

Weather Modification

Consultants to the National Academy of Sciences are calling for a more scientific approach to weather control research and emphasize that "a great increase in basic knowledge of atmospheric processes" is needed to make any "genuine" progress in this field. Both civilian and military advances may result.

Here is a summary of their newly released conclusions and recommendations:

* Improved Measurements Needed: An active program is required to develop improved instrumentation for measurement of such quantities as cloud temperatures, size and distribution of cloud particles and liquid and solid precipitation as well as other phenomena. Development of devices to obtain accurate measurements of the "space charge" carried on cloud particles is also to be desired. It is also considered necessary to improve the measurement of reliability of a network of rain gauges, snow surveys or radar echoes for determining amounts of rainfall.

* Basic Laboratory Research Needed: Laboratories should be encouraged to undertake studies which might extend into such areas as solid state physics, crystallography, surface chemistry, electron microscopy, and diffusion cloud chambers. This might lead to hypotheses suitable for field testing under natural atmospheric conditions.

* Exploratory Field Studies: Many exploratory investigations in the field can be carried out as "small-scale" or "one-man" projects. However, as investigations become more complex the importance of planning and statistical design becomes increasingly important. In many field experiments the natural variability is so great that effects, if any, may not be reproducible. Therefore, modern statistical methods, including the principles of randomization, may provide the most effective approach.

* Systematic Testing: To meet the requirements for a reasonable reproducibility of treatment on a number of comparable experimental units, an extensive program, covering a considerable period of time may be necessary. "Very few" of the rain-making or other modification experiments of recent years have been carried on long enough to produce convincing evidence or genuine effects due to treatments.

* Financial Support: It is suggested that many attempts at "practical" weather modification are made on a commercial basis and are rarely designed as scientific experiments. Therefore, financial support of weather modification experiments for developing scientific knowledge should be channeled into investigations of relevant basic atmospheric processes and of modification techniques "which employ scientific methodology and modern principles of statistical experimental design." Cooperation between meteorological and statistical research groups is said to be highly important. Universities or research institutions which have a strong group in one of these fields are urged to consider establishment of a research group in the other.

(These summaries and conclusions are the result of a conference at Shenandoah National Park, Virginia, May 1-3, 1959. Report available. 24 pages. Single copies free. Write Information Office, National Academy of Sciences, Washington 25, D.C. for NAS Publication 742)

Titanium Base Alloys

Problem: Determination of manganese in titanium alloys is said to be possible through a new technique developed by the Navy. The method was devised when difficulties arose in analysis when small amounts of manganese had to be determined. It was found that analytical methods which had been satisfactory for titanium-manganese alloys failed to yield accurate and reproducible results for residual concentrations -- particularly when other alloying or residual elements, such as chromium, were present.

Solution: The new method is based on acid-alkaline adjustment of a dilute acid solution of the titanium sample, using zinc oxide. With this adjustment, it is reported, the titanium, chromium, vanadium and other interfering elements are precipitated -- leaving the manganese in solution and available for determination. This can be accomplished by either oxidation-reduction or colorimetric reduction.

(R&D by Analytical Chemistry Branch, Metallurgy Division, U. S. Naval Research Laboratory, Washington 25, D.C.)

Satellite Orbits

A simple and direct approach for including the effects of the earth's oblateness in the calculation of satellite orbits is said to be feasible in studies sponsored by the U.S. Air Force. The method is said to be shorter and less complicated than other techniques such as the perturbation method usually applied. In addition, the need for special considerations at the critical orbital inclination is eliminated.

(Studies by J. P. Vinti, Mathematical Physics Group, National Bureau of Standards, Washington 25, D.C.)

Instrument Industry Outlook

Department of Commerce estimates that sales of scientific and process control instruments will reach $4.5 billion in 1960, representing about a 15 percent increase over the $3.9 billion estimated for 1959.

Biggest increase is expected to come from larger modernization outlays by the chemical and petroleum refining industries, and the ferrous and nonferrous metals industries. This is expected to contribute to higher spending in the process control instrument field. Laboratory facility expenditures by Government and private industry are not expected to change much next year. There'll be an adverse effect on the instrument industry due to reduced military aircraft purchasing, but this may be offset in part by increased purchases of jet planes by commercial airlines -- and by Defense spending for missiles, ships and harbor craft, and electronics and communications equipment.

(For further details write Information Office, Business and Defense Services Administration, U.S. Department of Commerce, Washington 25, D.C. Ask for Announcement ER-59-42 - Scientific and Process Control Industry Outlook)

Royalty-Free Patents

Here is a new listing of Government-owned patents now available for use by industry on a royalty-free basis. Subscribers desiring further information may write Service Department Washington SCIENCE TRENDS, 1120 National Press Building, Washington 4, D.C. You will be furnished with the patent number and classification and information on where to obtain the patent and where to apply for licensing.

( ) Turbine Blade: This patent covers a blade structure which includes a central tubular strut enveloped by a non-load carrying sheath. Cooling air is passed through the blade in a conventional manner, also cooling the strut and the shroud.

( ) Anti-Fogging Composition: This liquid composition is designed to prevent fogging of the plastic lenses of gas masks and is composed of water, alcohols, glycerol, lithium chloride and sodium tall oil methyl tauride.

( ) Switch: A light pressure on the push button is said to be all that is necessary to operate this push-to-talk switch for use in microphones and handsets.

( ) Titanium Production: In this patent titanium and titanium alloys are manufactured by a batch method. A reducing agent selected from alkali and alkaline earth metals is deposited in a reducing chamber.

( ) Gearing: This gearing is said to be useful in antenna drive systems, heavy machinery systems and the like. Any one of the gears may act as the drive gear.

( ) Battery-Watering Device: This patent covers a T-shaped pipe for filling the cells of a battery with water. An indicator tube shows when the cell is filled.

( ) Circuit-Tester: This device is designed to test the continuity of electrical or electronic circuitry in equipment such as radio and radar sets. It employs a pre-punched card corresponding to a circuit pattern and might speed mass production, according to the inventors.

( ) High Voltage Generator: This stabilized high voltage generating unit is for use with counter tubes.

( ) Internal Cutting Device: Cutting holes or slots of a precise and predetermined depth from the interior of a hollow metal workpiece is said to be simplified with this unit.

( ) Rectifiers: This patent covers a rectifier made up of a titanium dioxide semi-conductor and a silicon monoxide artificial barrier layer.

Research Checklist

( ) Iron-Water Studies: U.S. Geological Survey is studying the chemistry of iron in natural water, a matter of importance to many industries including high-grade paper making, brewing and food processing. Initial research has covered the theoretical aspects of dilute aqueous solutions that contain iron, and are expected to afford a basis for better understanding of the chemical principles which control such solutions.

(Report available. 30 pages. 15 cents. Write Superintendent of Documents, Government Printing Office, Washington 25, D.C. for Geological Survey W.S. Paper 1459-A)

( ) Radioactive Materials Handling: An improved method of cutting round holes in safety plate and leaded glass to accommodate special long-sleeved gloves necessary when working with radioactive materials in enclosures has been devised at the AEC Hanford Operations Office. Use of the new method has sharply reduced glass breakage, according to the AEC

(Report available. Single copies free. Write Safety and Fire Protection Branch, Office of Health and Safety, U.S. Atomic Energy Commission, Washington 25, D.C. for Accident and Fire Prevention Bulletin No. 103)

( ) Satellite Frequency Detector: Navy has developed a frequency detector for aid in reduction of satellite and meteor signal data recorded on magnetic tape at one of its Space Surveillance receiving sites. The device is designed to determine the frequency shift due to the doppler effect of such signals and may also be used in an automatic alerting system being proposed for such sites.

(Report to be published in the near future as NRL Report 5417 by U.S. Naval Research Laboratory, Washington 25, D.C.)

( ) Sandwich Construction: A Study by the Stanford Research Institute for the Navy predicts that by late 1963 the demand for low-density metal "sandwich" core material will run about 3.5 million board feet a year -- taxing industrial capacity. However, it is believed that a chronic shortage can be prevented since machines to make the core can be built and installed in four months or less. It is estimated that the price of brazed metal panels should go down from the present $150 to $200 a square foot to $50 to $75 by 1965.

( ) Strobolyzer: A device termed the "strobolyzer" has been developed at the National Bureau of Standards for exploratory research in the field of vibration analysis. It is said to permit the observation of vibrating bodies of any size and complexity, as well as motions from the submicroscopic to the directly visible, with frequencies ranging from subsonic to ultrasonic. The unit is said to have advantages over available apparatus in which the vibrating object must be viewed directly or through some optical system.

(Paper available. Single copies free. Write National Bureau of Standards, Office of Technical Information, Washington 25, D.C. for Reprint Paper 63C2-12)

Publication Checklist

( ) Lunar Sciences, a transcript of a press conference on lunar sciences as viewed by members of an NASA advisory panel. 39 pages. Single copies free. (Write Press Information Office, NASA, 1520 H Street, N.W., Washington 25, D.C. for Lunar Sciences Press Conference)

( ) High Temperature Measurements, a Los Alamos bibliography listing sources of information on the past ten years of high temperature measurement techniques. Mainly concerned with thermocouples, resistance bulbs, sonic pyrometer, infra-red and radiation pyrometers and microwave techniques. 43 pages. $1.25 (Write OTS, U.S. Department of Commerce, Washington 25, D.C. for LAMS 2325)

( ) Government Patents Board, a congressional study of the history and operations of the Government Patents Board. Calls for "urgent" legislative action to resolve policy differences among board members. 43 pages. Single copies free. (Write Patents Subcommittee, Senate Judiciary Committee, Washington 24, D.C., for Patent Practices of the Government Patents Board)

( ) Document Preservation, a report of the chemical stability and physical properties of cellulose acetate film used to preserve and restore old or damaged documents by lamination. 20 pages. 20 cents. (Write Superintendent of Documents, Government Printing Office, Washington 25, D.C. for Pub. C13.44:5)

( ) Uranium and Thorium, a new listing of reports by the U.S. Geological Survey concerning geology, mineralogy or chemistry of uranium or thorium. Also includes some reports on beryllium, lithium and other rare elements of interest in atomic energy. 167 pages. 50 cents. (Write Superintendent of Documents, Government Printing Office, Washington 25, D.C. for Pub. I 19.3:1107-A)

( ) Oceanography, the latest chapter of "a report in progress"on various phases of oceanography. 21 pages. Single copies free. (Write Information Office, National Academy of Sciences, 2101 Constitution Avenue, Washington 25, D.C. for Chapter 2 - Basic Research in Oceanography)

( ) Samarium, a report presenting measurements of heats of samarium (III) oxide and chloride in hydrochloric acid and other information on thermochemistry. 8 pages. Single copies free. (Write Publication-Distribution Section, U.S. Bureau of Mines, 4800 Forbes Avenue, Pittsburgh 13, Pa., for Report of Investigation No. 5525)

( ) Beryllium, this literature search performed by Lockheed Aircraft for the Navy covers unclassified material relating to fabrication methods, methods for cladding and electrodeposition and similar material. 58 pages and 241 references. $1.50 (Write OTS, U.S. Dept. of Commerce, Washington 25, D.C. for PB 161 012)

( ) Helical Beam Antennas, this bibliography covers 66 abstracts of papers and reports on the helical beam antenna. Prepared by the National Research Council of Canada. 23 pages. Microfilm, $2.70; Photocopy, $4.80. (Order PB 142 876 through Photoduplication Service, Library of Congress, Washington 25, D.C.)